

Amendments to the Drawings:

In FIG. 12, the axis is labeled A/C.

Attachment: One drawing sheet replacing original sheet 6/6

REMARKS

In the Office Action dated December 26, 2008, the Examiner objects to claim 13 and rejects claims 1, 3, 6, 7, 9, 12-14 and 19 under 35 U.S.C. § 102(b). The Examiner rejects claims 2, 4, 5, 8, 10, 11, 15, 17 and 18 under 35 U.S.C. § 103(a). With this Amendment, claims 1-19 are amended. No claims are added or canceled. After entry of this Amendment, claims 1-19 are pending in the Application. Reconsideration of the Application as amended is respectfully requested.

Applicants have amended the specification to correct several typographical and grammatical errors. Applicants submit that these changes merely conform the corrected portions of the specification to the remainder thereof and the drawing figures as originally filed. In paragraph [0086], a sentence has been removed as clearly incorrect in view of equation (6).

Applicants have also corrected an error in FIG. 12. Specifically, the label for the axis A/C is added. This change is supported by the specification at paragraphs [0068] and [0077]. Entry of the revised drawing sheet is respectfully requested.

The Examiner states that the Applicants have not filed a certified copy of the priority document as required by 35 U.S.C. § 119(b). This application is a National phase filing of International application No. PCT/IB2005/003770, and the Applicants timely submitted the certified copy of the priority document in compliance with Rule 17.1(a) or (b) as described in the attached Notification Concerning Submission or Transmittal of Priority Document. Accordingly, a duplicate transmission to the USPTO is not required.

The Examiner objects to the preamble of claim 13. While Applicants disagree as the antecedent basis for the second reference to the vehicle was clear, Applicants have amended the preamble as suggested by the Examiner.

The Examiner rejects claim 1 and its dependent claims 3 and 6 under 35 U.S.C. § 102(b) as being anticipated by Kato et al. (US 6,082,482). Applicants have amended claim 1 to more particularly point out and distinctly claim the invention. With respect to the reaction force device, Applicants have clarified that the control signal calculated based on a formula including a plurality of terms, the plurality of terms including at least a steering angle term, a steering angle velocity term and a steering angle acceleration term. The controller is

adapted to vary the control signal in response to the hands-free sensor signal to reduce the steering reaction force applied when the hands-off state is indicated relative to the steering reaction force applied when the hands-on state is indicated by using a value of at least one of a coefficient and a gain for a term in the formula when the hands-off state is indicated that is different from a value used when the hands-on state is indicated. Conforming changes are made to dependent claims 2-5. Dependent claim 6 is amended to clarify the value of the at least one of the coefficient and the gain is based on the steering torque.

Applicants submit that Kato et al. fails to teach or suggest the features of claim 1 as amended. Kato et al. teaches a steer-by-wire system that detects a hands-on or a hands-off state of a steering wheel 2. (Abstract). The embodiments of Kato et al., except for the third embodiment described with respect to FIG. 10, provide completely separate calculations for controlling the reaction force of the steering motor based on whether the hands-on or hands-off condition is detected. With respect to the first embodiment, the calculation is based on the target steering operating angle θ_M and the steering operating angle θ_S in the hands-off condition and is based on the reaction force instruction torque T_M , the steering torque T_S and the reaction force motor current J_S in the hands-on condition. With respect to the second embodiment, the calculation is based on the target steering operating angular speed $d\theta_M$ and the steering operating angular speed $d\theta_S$ in the hands-off condition and is based on the reaction force instruction torque T_M , the steering torque T_S and the reaction force motor current J_S in the hands-on condition. With respect to the third embodiment, the calculation is based on the reaction force instruction torque T_M , the steering torque T_S and the reaction force motor current J_S in both the hands-off condition and the hands-on condition, but the reaction force instruction torque T_M is reduced before the calculation in the hands-off condition.

According to claim 1 and its dependent claims, a control signal to apply a steering reaction force to the steering wheel is calculated based on a formula including at least a steering angle term, a steering angle velocity term and a steering angle acceleration term. When the hands-off state occurs, the control signal varies to reduce the steering reaction force relative to that applied when the hands-on state occurs. In this manner, the invention provides a simple yet extremely flexible way to control steering reaction force

under varying steering conditions that is responsive to those conditions. Kato et al. fails to teach or suggest these features of claim 1 and its dependent claims, so claim 1 and its dependent claims are allowable over Kato et al.

The Examiner rejects claim 7 and its dependent claims 9 and 12 under 35 U.S.C § 102(b) as being anticipated by Kato et al. Claim 7 has been amended to state that the steering reaction force is responsive to a control signal calculated based on a formula including a plurality of terms, the plurality of terms including at least a steering angle term, a steering angle velocity term and a steering angle acceleration term. Claim 7 as amended also states that a steering reaction force correction component is adapted for reducing the steering reaction force applied when the hands-off state is detected relative to the steering reaction force applied when the hands-on state is detected by using a value of at least one of a coefficient and a gain for a term in the formula when the hands-off state is detected that is different from a value used when the hands-on state is detected. Conforming amendments have been made to claims 8-11, and claim 12 has been amended to state that the value of the at least one of the coefficient and the gain is based on the steering torque.

As explained above with respect to claim 1, Kato et al. fails to teach or suggest using such a formula. Kato et al. also fails to teach or suggest using different values for a coefficient and/or a gain in term(s) of the formula based on whether a hands-on or a hands-off state is detected. Accordingly, it is clear that Kato et al. fails to teach or suggest all of the features of claim 7 as amended. Claim 7 and its dependent claims are allowable over Kato et al.

The Examiner rejects claim 13 under 35 U.S.C § 102(b) as being anticipated by Kato et al. Claim 13 now provides that the steering reaction force is responsive to a control signal calculated based on a formula including a plurality of terms, the plurality of terms including at least a steering angle term, a steering angle velocity term and a steering angle acceleration term. The reducing means of claim 13 has been amended to recite means for reducing the steering reaction force in the hands-on state when the hands-off state is detected by using a value of at least one of a coefficient and a gain for a term in the formula when the hands-off state is detected that is different from a value used when the hands-on state is detected. Applicants respectfully submit that Kato et al. fails to teach or suggest such

a formula. Kato et al. also fails to teach or suggest any structure that performs the recited function of the claimed reducing means. The invention of claim 13 is patentable over Kato et al.

The Examiner rejects claim 14 and its dependent claims 16 and 19 under 35 U.S.C § 102(b) as being anticipated by Kato et al. Claim 14 has been amended similarly to claim 13 as it now includes the feature whereby the steering reaction force is responsive to a control signal calculated based on a formula including a plurality of terms, the plurality of terms including at least a steering angle term, a steering angle velocity term and a steering angle acceleration term. Also, claim 14 now includes the step of reducing the steering reaction force applied when the hands-off state is detected relative to the steering reaction force applied when the hands-on state is detected by using a value of at least one of a coefficient and a gain for a term in the formula when the hands-off state is detected that is different from a value used when the hands-on state is detected. Claims 15-18 have been amended to conform to the changes to claim 14, and claim 19 is amended to state that the value of the at least one of the coefficient and the gain is based on the steering torque.

Applicants submit that Kato et al. fails to teach or suggest the features of claim 14 as amended. No embodiment of Kato et al. uses or incorporates a formula including a plurality of terms including at least a steering angle term, a steering angle velocity term and a steering angle acceleration term. Moreover, no embodiment of Kato et al. teaches or suggests using such a formula in reducing steering reaction force applied depending on a detected hands-on or hands-off state by varying the value of a coefficient and/or a gain for a term in the formula. Claim 14 and its dependent claims are thus allowable over Kato et al.

Finally, the Examiner rejects claims 2, 8 and 15 under 35 U.S.C. §103(a) as being unpatentable over Kato et al. in view of Higashira et al. (US 5,908,457) and rejects claims 4, 5, 10, 11, 17 and 18 as being unpatentable over Kato et al. in view of Serizawa et al. (US 5,347,458). Applicants first submit that Higashira et al. and Serizawa et al. fail to cure the deficiencies identified with respect to the independent claims from which each of these claims depends. Neither Higashira et al. nor Serizawa et al. discuss hands-on versus hands-off states at all.

Applicants next submit that the Examiner appears to be relying on

impermissible hindsight reconstruction of the invention using the Applicants' disclosure as a template. Neither Higashira et al. nor Serizawa et al. discuss hands-on versus hands-off states as mentioned previously, and there is no teaching of how to combine the features therein with the existing teachings of Kato et al. The Examiner states that it is sufficient that Kato et al. teachings reducing the reaction force to zero, so it would be obvious to reduce the reaction force associated with road friction, steering angle velocity and steering angle acceleration to zero. However, and as described by Applicants in their specification, all systems would eventually reduce the reaction force to zero in any hands-off condition, the issue is that systems and methods like Higashira et al. and Serizawa et al. would result in overshoot. Kato et al. does not address how to resolve the overshoot based on inputs other than those described therein.

Further, at least one of these inventions was presumably known to Kato et al. at the time of invention (Higashira et al. shares an assignee with Kato et al.), and Kato et al. did not consider the reaction force associated with road friction, negating the assumption that one skilled in the art at the time the invention was made would make the combination that the Examiner did to reject claims 2, 8 and 15.

For the foregoing reasons, and based on their dependence from respective allowable independent claims, claims 2, 4, 5, 8, 10, 11, 15, 17 and 18 are allowable.

It is submitted that this Amendment has antecedent basis in the Application as originally filed, including the specification, claims and drawings, and that this Amendment does not add any new subject matter to the Application. Consideration of the Application in view of these comments is requested. It is submitted that the Application is in suitable condition for allowance; notice of which is requested.

If the Examiner feels that prosecution of the present application can be expedited by way of an Examiner's amendment, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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